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The Adjustment Disorder - New Module 20 as a Screening Instrument: Cluster Analysis and Cut-off Values

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Abstract: BACKGROUND Adjustment disorder (AjD) is a transient mental health condition emerging after stressful life events. Its diagnostic criteria have recently been under revision which led to the development of the Adjustment Disorder–New Module 20 (ADNM-20) as a self-report assessment. **OBJECTIVE** To identify a threshold value for people at high risk for AjD. **METHODS** As part of a randomized controlled trial evaluating a self-help manual for burglary victims, the baseline data of all participants (n=80) were analyzed. Besides the ADNM-20, participants answered self-report questionnaires regarding the external variables post-traumatic stress disorder symptomatology, depression, anxiety, and stress levels. We used cluster analysis and ROC analysis to identify the most appropriate cut-off value. **RESULTS** The cluster analysis identified three different subgroups. They differed in their level of AjD symptomatology from low to high symptom severity. The same pattern of impairment was found for the external variables. The ROC analysis testing the ADNM-20 sum score against the theory-based diagnostic algorithm, revealed an optimal cut-off score at 47.5 to distinguish between people at high risk for AjD and people at low risk. **CONCLUSION** The ADNM-20 distinguishes between people with low, moderate, and high symptomatology. The recommendation for a cut-off score at 47.5 facilitates the use of the ADNM-20 in research and practice.

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The Adjustment Disorder–New Module 20 as a Screening Instrument: Cluster Analysis and Cut-off Values

L Lorenz, RC Bachem, A Maercker

Abstract

Background: Adjustment disorder (AjD) is a transient mental health condition emerging after stressful life events. Its diagnostic criteria have recently been under revision which led to the development of the Adjustment Disorder–New Module 20 (ADNM-20) as a self-report assessment.

Objective: To identify a threshold value for people at high risk for AjD.

Methods: As part of a randomized controlled trial evaluating a self-help manual for burglary victims, the baseline data of all participants (n=80) were analyzed. Besides the ADNM-20, participants answered self-report questionnaires regarding the external variables post-traumatic stress disorder symptomatology, depression, anxiety, and stress levels. We used cluster analysis and ROC analysis to identify the most appropriate cut-off value.

Results: The cluster analysis identified three different subgroups. They differed in their level of AjD symptomatology from low to high symptom severity. The same pattern of impairment was found for the external variables. The ROC analysis testing the ADNM-20 sum score against the theory-based diagnostic algorithm, revealed an optimal cut-off score at 47.5 to distinguish between people at high risk for AjD and people at low risk.

Conclusion: The ADNM-20 distinguishes between people with low, moderate, and high symptomatology. The recommendation for a cut-off score at 47.5 facilitates the use of the ADNM-20 in research and practice.

Keywords: Adjustment disorder; Trauma and stressor related disorders; Symptom assessment; Diagnosis

Introduction

Adjustment disorder (AjD) is defined as the development of emotional and behavioral symptoms in response to a life stressor.¹ Maercker, Einsle, and Köllner² proposed a stress-response syndrome conceptualization of AjD during the revision of the Diagnostic and Statis-

tical Manual for Mental Disorder (DSM-5)³ and in the International Classification of Diseases (ICD-10)¹. This model forms the basis for the upcoming ICD-11 symptom definition.⁴ Key symptoms are preoccupation with the stressor and failure to adapt.⁵ Symptoms of preoccupation include recurrent and distressing thoughts or constant rumination about the stressful

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event. Failure to adapt symptoms are for example sleep disturbances or difficulties in concentrating.⁵ In line with this new conceptualization of AjD, Einsle, Köllner, Dannemann, and Maercker⁶ developed and initially validated a self-report assessment, the Adjustment Disorder–New Module (ADNM). There are two versions of the ADNM: the original 29-item version, and a 20-item short version. Several validation studies of both versions indicated satisfying psychometric properties.^{6–8}

As of to date, clinical judgement of a professional is usually used to diagnose AjD. There is no existing gold-standard for the standardized assessment. Nevertheless, there remains a need for a fast, structured assessment of AjD symptoms.⁹ The ADNM-20 aims at this goal.⁶ However, no cut-off value exists for identifying people at high risk of AjD. Therefore, the objective of the current study was to find first evidence for possible cut-off-values of the ADNM-20 in a sample of Swiss burglary victims.

Materials and Methods

Sample and Procedure

The sample consisted of 80 burglary victims who participated in a randomized controlled trial on the effectiveness of a self-help guide for burglary victims. It is based on a previously (in German language) reported data set of 74 persons.¹⁰ The study was approved by the University of Zurich Ethics Review Board and informed consent was obtained from each participant. For further details of the procedure see Bachem and Maercker.¹¹

In this analysis, we included the data of all participants who completed the first questionnaire and who fulfilled the inclusion criteria of the study. Participants were at least 18 years old and had experienced a burglary during the two years prior to par-

ticipation. Of the 80 participants, 14 (18%) were male and 66 (83%) were female. The mean age was 48 (SD 15.3, range 19 to 82) years. The mean time between the burglary and administration of the first questionnaire was 21.3 (SD 22.7, range 1.6 to 98.3) weeks. At first wave, 23 (29%) participants were at high risk for AjD, according to a theory-driven diagnostic algorithm that aims at identifying clinically significant cases.⁸ Prevalence rates were approximately the same in both male and female subsamples (29%, $n=4$ and 29%, $n=19$, respectively).

Measures

Adjustment Disorder–New Module 20 (ADNM-20)

The ADNM-20 is a self-report measure consisting of two parts: a stressor list and an item list.⁶ The stressor list captures a broad range of acute and chronic life events of the past two years. The item list measures the symptoms in response to the most distressing event(s). In this sample, all items were answered regarding the recently experienced burglary. Participants indicate on a 4-point Likert scale, ranging from 1 (never) to 4 (often), how often they have experienced different symptoms of an AjD during the past two weeks. The ADNM-20 consists of six subscales: preoccupation (4 items), failure to adapt (4 items), avoidance (4 items), depressive mood (3 items), anxiety (2 items), and impulse disturbance (3 items). As preoccupation and failure to adapt are the core symptoms of the new AjD diagnosis, those two subscales can be subsumed as one scale for the core symptoms (AjD-C). The subscales describing accessory symptoms can also be summarized in one scale (AjD-AS). Symptom severity can be evaluated either by the sum score of all items (ADNM-20 sum score), and the sum score of the subscales, or by a theory driven diagnostic algorithm.

For more information on adjustment disorders in Italy see <http://www.theijoem.com/ijoem/index.php/ijoem/article/view/716>



This algorithm identifies people at high risk for an AjD diagnosis and is based on the core symptoms of AjD. High risk is defined as one item rated ≥ 3 and at least two items rated ≥ 2 in both core symptom clusters and a rating ≥ 3 on the impairment criterion (item 20: "All in all, the situation causes serious impairment in my social life or occupational life, my leisure activities or other important areas of functioning"). The internal consistency of the ADN-20 sum score was high (Cronbach's α 0.94) in the current sample. AjD-C and the core symptom scales had also high internal consistencies (AjD-C Cronbach's α 0.90, preoccupations Cronbach's α 0.88, failure to adapt Cronbach's α 0.80). The subscale for accessory symptoms showed a high internal consistency (Cronbach's α 0.89).

Depression Anxiety Stress Scales (DASS-21)

The DASS-21 is the 21-item short version of the Depression Anxiety Stress Scales by Lovibond and Lovibond.¹²⁻¹⁴ With seven items per scale, it measures low positive affectivity (depression), physiological hyperarousal (anxiety), and negative affectivity (stress) for the past week. Response categories range from 1 (never) to 3 (most of the time). Henry and Crawford¹⁵ reported high internal consistency of the total score (Cronbach's α 0.88) and of the subscales (depression Cronbach's α 0.82, anxiety Cronbach's α 0.90, stress Cronbach's α 0.93) in a non-clinical sample. Convergent and discriminant validity were satisfactory.¹⁵

Post-traumatic Stress Symptoms (PTSD-ICD-11)

The seven items of the PTSD-ICD-11 measure symptoms of post-traumatic stress disorder according to the ICD-11 model⁵ over the past month, and have previously been used in international samples¹⁶. The response format is a 4-point Likert scale,

TAKE-HOME MESSAGE

- Adjustment disorder (AjD) is a transient mental health condition occurring after serious but non-traumatic life stress.
- The Adjustment Disorder–New Module 20 (ADNM-20) is a self-report assessment consisting of a stressor list and an item list.
- Based on cluster analysis and ROC-analysis, a cut-off score at 47.5 is recommended for the use in science and practice.

ranging from 1 (never or up to once a month) to 4 (five times a week or almost always). Internal consistency in this study was high (Cronbach's α 0.82).

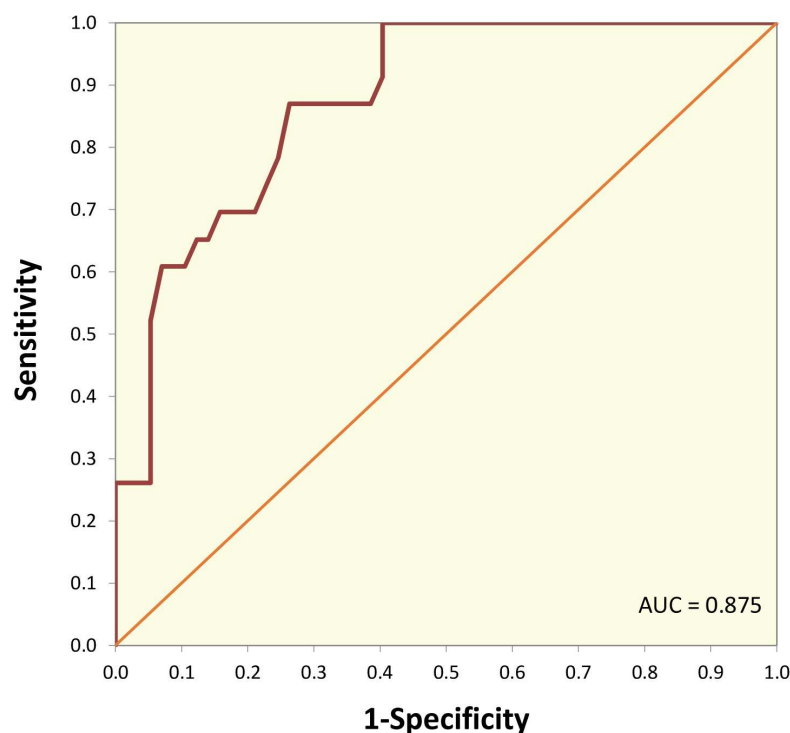
Data Analysis

Data were analyzed using IBM SPSS® Statistics for Windows® ver 22. Missing data were imputed by the mean of the corresponding scale.¹⁷ In a first step, a Ward's hierarchical cluster analysis was administered to see whether the ADN-20 sum score distinguishes between groups that differ in certain psychological markers. As a distance measure, the squared Euclidean distance was used. The main cluster variables were preoccupation and failure to adapt because those items represent the core symptoms for a diagnosis. Visual inspection of the dendrogram suggested a three-factor solution so that each person could be allocated in one specific subgroup. One-way analysis of variance (ANOVA) was carried out to determine if those subgroups differ in symptomatology and external variables (PTSD-ICD-11, DASS-21). In a second step, we conducted a ROC analysis testing the ADN-20 sum score against the theory-based diagnostic algorithm. As there is no universally accepted gold-standard for a standardized assessment of AjD, the theory-based diagnostic algorithm was considered the gold-standard in this study. The criteria for an optimal cut-off value was set by the

Table 1: Mean (SD) for study measures stratified by levels of AjD severity

Measures	Symptom severity		
	Low	Moderate	High
ADNM-20 sum score	30.1 (6.2)	45.7 (5.6)	59.6 (6.8)
AjD-C	12.7 (2.3)	19.7 (1.7)	26.4 (1.7)
Preoccupations	7.6 (1.8)	11.7 (1.7)	14.8 (1.3)
Failure to adapt	5.1 (0.9)	8.0 (1.5)	11.6 (1.6)
PTSD-ICD-11 total	9.0 (1.6)	15.0 (3.6)	18.7 (3.3)
DASS-21 total	4.8 (5.5)	15.0 (12.2)	24.3 (9.4)
Depression	1.1 (2.1)	4.0 (4.1)	7.0 (4.0)
Anxiety	0.9 (1.3)	4.4 (4.3)	7.2 (3.8)
Stress	2.8 (3.3)	6.7 (5.1)	10.1 (3.8)

All row-wise group differences are significant ($p < 0.001$).

**Figure 1:** Receiver operating characteristic (ROC) curve for different cut-off values of ADNM-20 sum score against the theoretical algorithm for the diagnosis of AjD.

Youden's index.¹⁸ This index combines test sensitivity and specificity at each possible value and sets the cut-off at its maximum value. Sensitivity, specificity, positive predictive value and negative predictive value of this score were evaluated.

Results

Cluster Analysis

Ward's hierarchical cluster analysis with Euclidean distance revealed a three-cluster solution as the best option. Participants in the three clusters showed different levels of AjD symptomatology. The clusters were labelled "low symptom severity (lss)," "moderate symptom severity (mss)," and "high symptom severity (hss)." A similar pattern of increase in symptomatology can be found on subscale level, on the PTSD-ICD-11, and DASS-21 scales. Table 1 gives an overview of the mean scores in the three clusters. The ANOVA for the ADNM-20 sum score was significant ($p < 0.001$). We used *post hoc* comparisons with Bonferroni correction to identify significant group differences. After Bonferroni correction, all p values < 0.016 should be considered statistically significant. The lss group differed significantly from the mss group ($p < 0.001$); the mss group differed significantly from the hss group ($p < 0.001$). For all other measures, ANOVAs were also significant ($p < 0.001$). All *post hoc* comparisons with Bonferroni correction were significant.

ROC Analysis

In our sample, 23 (29%) subjects met the diagnostic criteria of an AjD according to the diagnostic algorithm. The mean ADNM-20 sum score was significantly ($p < 0.01$) higher in participants with AjD (mean 57.04, SD 8.71) than participants without AjD (mean 39.84, SD 11.45). A ROC analysis that tested the ADNM-20

sum score against the theoretical algorithm was conducted (Fig 1). Area under the curve (AUC) was 0.875, which can be classified as moderately accurate.¹⁹ The Youden's index reached its maximum at a cut-off value of 47.5, indicating that the diagnosis of AjD is very likely in every person scoring 48 or higher on the ADN-20. The test sensitivity at this cut-off was 87% (95% CI 73% to 100%) and the specificity was 74% (95% CI 63% to 85%). The positive predictive value was 57% while the negative predictive value was 93%.

Discussion

Our research group had recently developed the ADN-20 as a questionnaire for assessing AjD symptoms according to the stress-response model proposed by Maercker, *et al*,² which forms the basis for the upcoming ICD-11 symptom definition. The objective of this study was to find first evidence for cut-off values for the ADN-20 by cluster analysis and ROC analysis.

The cluster analysis showed that the ADN-20 subscales preoccupation and failure to adapt identify subgroups that differ significantly in their symptom severity, *ie*, ADN-20 sum score. Moreover, they also differ significantly in external variables, namely post-traumatic stress symptoms, depression, anxiety, and stress levels. These results indicate that the ADN-20 has diagnostic validity. The next step was to find an appropriate cut-off value that identifies people at high risk for AjD. The ROC analysis revealed an optimal cut-off at 47.5. This indicates that every person that scores 48 or higher on the ADN-20 is at high risk for AjD. The ADN-20 should identify people at high risk and rule out healthy people solidly because it is used as a screening instrument; 87% of those having an AjD according to the diagnostic algorithm can be identified by this cut-off (sensitivity) and 93% of in-

dividuals screened negative by the ADN-20 sum score have in fact no AjD (negative predictive value). These scores show that a cut-off at 47.5 meets the requirements and that it can be used to make a reliable prognosis. Furthermore, the sensitivity and specificity of the ADN-20 is comparable with common and frequently used screening instruments for affective disorders, *eg*, the Hospital Anxiety Depression Stress Scale,²⁰ which shows a sensitivity of 78% and a specificity of 71% in the prediction of depression.²¹

One major limitation of the study is the fact that ROC analysis usually compares a well-established instrument (*ie*, the gold-standard) with a new assessment method. Here, the comparison was between two different ways of evaluating the same questionnaire. This is mainly due to the fact that as of to date, no gold-standard test exists in the context of AjD. Therefore, new and innovative means were required to gain first insight into cut-offs of the ADN-20. In further studies concerning this topic, the ADN-20 sum score could be tested against other measures like the clinical judgement or structured interview. In an ongoing project, an AjD module was designed for the Composite International Diagnostic Interview (CIDI).²² This creates the opportunity to compare the interview-based diagnosis with the ADN-20 sum score in future studies. Another limitation concerns the generalizability of results. The sample size was rather small and it consisted mostly of females. Furthermore, the sample of the study consisted of a risk group for the AjD diagnosis. Therefore, results should be applied to general population with caution. Further investigations with population-based samples are needed to make clear suggestions about cut-off values for the ADN-20. Nevertheless, our results give first evidence, where the critical level of symptomatology is.

Despite these limitations, this study

showed further evidence for the diagnostic utility of the ADN-20 in the assessment of AjD symptoms. Moreover, it proposes a new, efficient way of identifying individuals at high risk for AjD by introducing a cut-off value. Based on the present results, the ADN-20 can be recommended in research and clinical practice to evaluate a person's current state of AjD symptomatology.

Conflicts of Interest: None declared.

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